NS9010 Data Sheet V1.1

ShenZhen Nsiway Technology Co., Ltd

2009,07

CONTENTS

GENERAL DESCRIPTION 4
FEATURES 4
APPLICATIONS 4
TYPICAL APPLICATION CIRCUIT 4
ABSOLUTE MAXIMUM RATINGS 5
ELECTRICAL CHARACTERISTICS 5
PIN CONFIGURATION 7
- PIN LAYOUT 7
- PIN DISCRIPTION 7
- MARKING INFORMATION 7

TYPICAL CHARACTERISTICS 8
APPLICATION INFORMATION 9
- BLOCK DIAGRAM 9
- PROPER SELECTION OF OUTPUT CAPACITOR 9
- OUTPUT CURRENT LIMITING 10
- THERMAL CONSIDERATIONS 10
- SHORT CIRCUIT PROTECTION 10
- EFFICIENCY 10
- PROPER SELECTION OF PACKAGES 10

PHYSICAL DIMENSIONS 11

FIGURE LISTS

Figure1. NS9010 Typical Application Circuit 4
Figure2. NS9010 SOT23-5L Package(top view) 7
Figure3. The block diagram of NS9010 9
Figure4. Region of Stable COUT ESR vs. Load Current 9
Figure5. The Package of SOT23-5L 11

TABLE LISTS

Table1. Absolute Maximum Ratings 5
Table2. Electrical Characteristics（VIN=3.6V,TA=25℃,CIN=1μF） 5
Table3. Pin Discription 7
Table4. The Relation Between The Output Voltage Code and Output Voltage 7

General Description

The NS9010 is a low noise, low dropout,and fast response LDO regulator.The output voltage is from 1.2V to 3.6V, offers ±2% accuracy.The NS9010 features include current limiting, over temperature, output shortcircuit protection, providing maximum safety to end users.The NS9010 can operate stably with verysmall ceramic output capacitors,also operate stably with larger 1μF output capacitors, can operate stably with the ESR of output capacitors from 20mΩ to 1Ω,this supplies more choices for users. The NS9010comes in SOT23-5L package, and is specified over the –40℃ to +85℃ temperature range.

Features

- Delivering Up to 250mA
- Ultra-Low Dropout Voltage: 300mV at 250mA Output
- Highly Accurate: ±2%
- Output Voltage Noise Less 50μVrms
- Fast Response in Line/Load Transient
- Including Current Limit Protection,Thermal Shutdown Protection,Short Circuit Protection
- Shut Down Current Less 0.1μA
- Operating Voltage Ranges : 2.5V to 5.5V
- Output Voltage Ranges :1.2V to 3.6V
- Operating Temperature Range : -40℃ to +85℃
- Small Package:SOT23-5L

Applications

- Cellular Handsets
- Digital Camera
- PDAs
- Portable Information Appliances(MP3/MP4/DFP/Portable DVD)

Typical Application Circuit

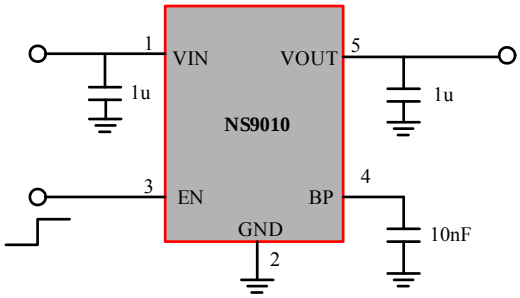


Figure1.NS9010 Typical Application Circuit

Absolute Maximum Ratings

Table1.Absolute Maximum Ratings

PARAMETER		MIN	MAX	UNITS	NOTICE
I/O Pin Voltages		-0.3	6.0	V	
Power Dissipation, (P_D@ T_A = 25℃)			450	mW	SOT23-5L
Junction Temperature			150	℃	
Storage Temperature		-65	150	℃	
Lead Temperature (soldering, 10s)			260	℃	
Package Thermal Resistance(θ_{JA})			240	℃/W	SOT23-5L
Operating Temperature Range		-40	85	℃	
ESD Susceptibility			±2000	V	HBM
Latch-up	+IT		150	mA	JEDEC STANDARD NO.78A FEBURARY 2006
	-IT		-150	mA	

Note1:Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device.

Electrical Characteristics

Table2. Electrical Characteristics（VIN=3.6V,TA=25℃,CIN=1μF）

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Voltage		2.5		5.5	V
V_{DO}	Dropout Voltage	I_{OUT}=250mA	-	300		mV
V_{OUT}	Output voltage		1.2		3.6	V
△V	VOUT Accuracy	I_{OUT}=0~250mA	-2		2	%
I_Q	Quiescent Current	VIN=3.6V, VEN=1.8V, Iout=0		300		μA
		VIN=3.6V, VEN=2.8V, Iout=0		150		μA
		VIN=3.6V, VEN=3.6V, Iout=0		150		μA
I_{SD}	Shutdown Current	VEN=0V,VIN=3.6V		0.1	1	μA
$\triangle V_{LI}$	Line Regulation	VIN=VOUT+0.4V (VIN>2.5V) I_{OUT}=100mA		0.02	0.1	%
	Dynamic Line Regulation	VIN=VOUT+0.4V (VIN>2.5V) I_{OUT}=100mA,Tr/Tf=2μs		6		mV
$\triangle V_{LO}$	Load Regulation	VIN=VOUT+0.4V (VIN>2.5V) I_{OUT}=0~250mA		0.05	0.2	%

	Dynamic Load Regulation	VIN=VOUT+0.4V (VIN>2.5V) I_{OUT}=1~250mA, Tr/Tf=2μs		25		mV
PSRR	Power Supply Rejection Rate	VIN=VOUT+0.4V (VIN>2.5V),I_{OUT}=100mA, CL=1μF,f=1KHz		-70		dB
Noise	Output Voltage Noise	CL=1μF, I_{OUT}=1mA		50		μVrms
I_{LP}	Current Limit	VIN=2.5~5.5V	230	250	270	mA
V_{IH}	High Input Threshold	VIN=2.5~5.5V	1.5			V
V_{IL}	Low Input Threshold	VIN=2.5~5.5V			0.4	V
T_{ON}	Turn On Time			20		μs
T_{OFF}	Turn Off Time	V_{EN}=0V		60		μs
T_P	Thermal Shutdown Temperature			150		℃
	Thermal Shutdown Hysteresis			30		℃

Pin Configuration

Pin Layout

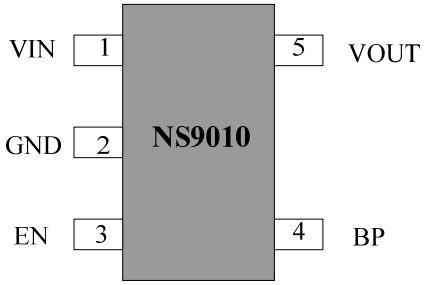


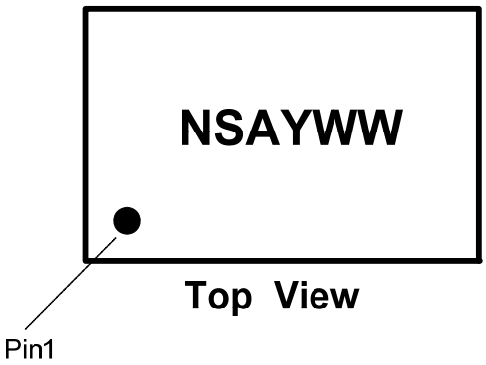
Figure2.NS9010 SOT23-5L Package(top view)

Pin Discription

Table3. Pin Discription

Pin NO.	Pin Name	Description
1	VIN	Supply Voltage
2	GND	Common Ground
3	EN	Chip Enable(Active High)
4	BP	Bypass
5	VOUT	Output Voltage

Marking Information



NS: Corporation Code

A: The Output Voltage (see***Table1.*** for detail)

YWW: Date Code

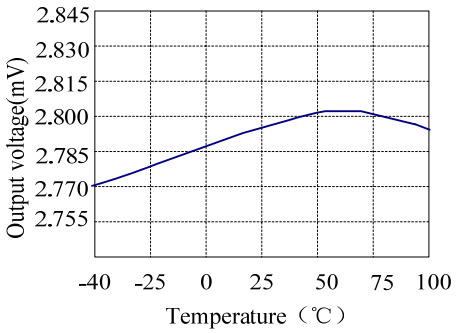
Table4. The Relation Between The Output Voltage Code and Output Voltage

Output Voltage Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Output Voltage	1.2	1.3	1.5	1.8	1.85	2.0	2.5	2.55	2.7	2.8	2.85	3.0	3.1	3.2	3.3	3.6

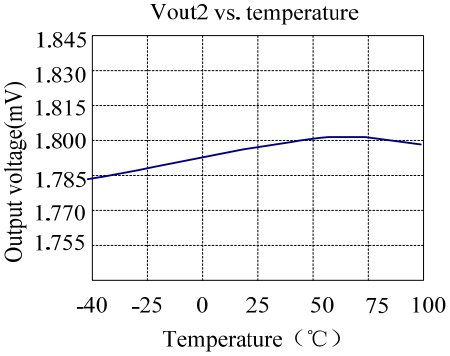
Typical Characteristics

Conditions:VIN＝3.6V, TA＝25℃, CIN＝COUT=1μF

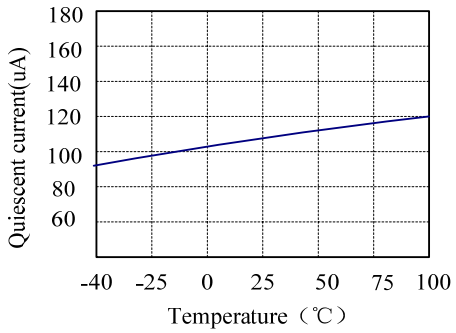
Vout1 vs. temperature



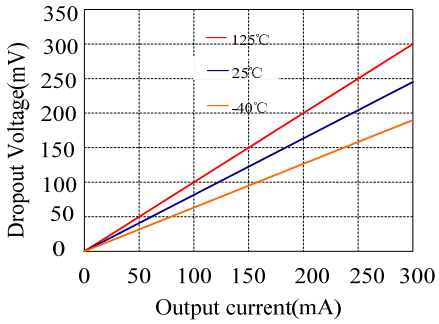
Vout2 vs. temperature



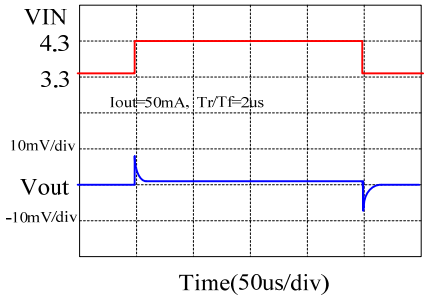
Iq vs. temperature



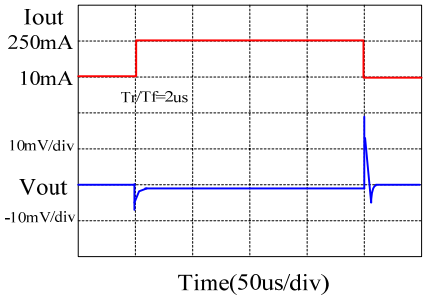
Dropout Voltage vs. output current



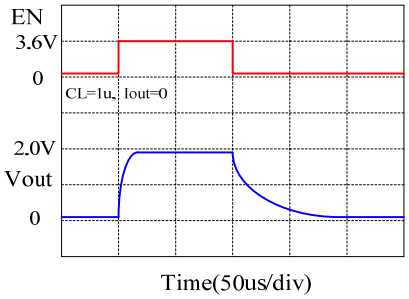
Line transient response



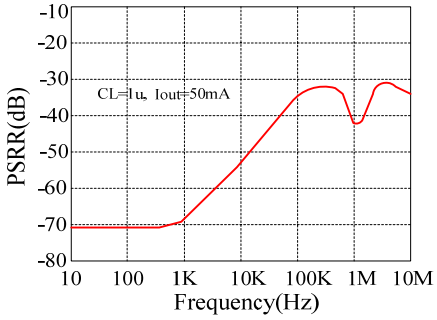
Load transient response



Enable & shutdown response



PSRR



Application Information

Block Diagram

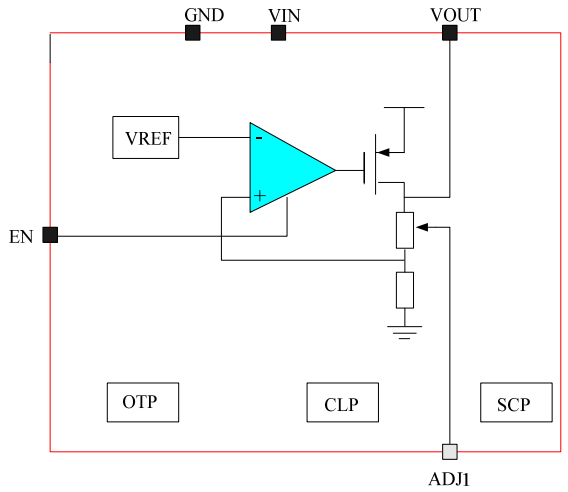


Figure3.The block diagram of NS9010

PROPER SELECTION OF OUTPUT CAPACITOR

The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application. The NS9010 is designed specifically to work with low ESR ceramic output capacitor in space-saving and performance consideration. Using a ceramic capacitor whose value is at least 1μF with ESR is from 10mΩ to 1Ω on the NS9010 output ensures stability. Output capacitor of larger capacitance can reduce noise and improve load transient response,stability, and PSRR. The output capacitor should be located not more than 0.5 inch from the VOUT pin of the NS9010 and returned to a clean analog ground.

Region of Stable C_{OUT} ESR vs. Load Current when C_{OUT}=1μF,show as figure:

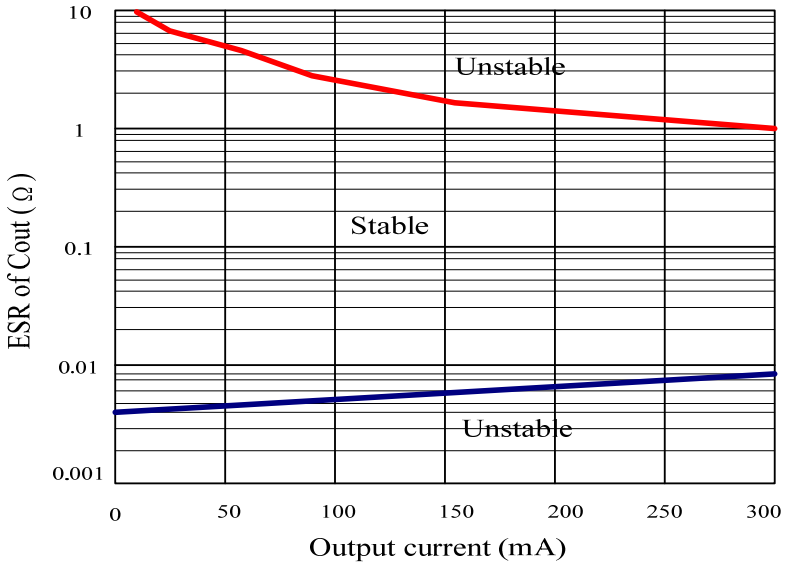


Figure4.Region of Stable COUT ESR vs. Load Current

OUTPUT CURRENT LIMITING

There is a current limiting protection circuitry in NS9010.When the accident happens,the output current reachs the value of current limiting(typ=250mA),the current limiting protection circuitry start to work and force the output current to keep current limiting.But the device works all the way.As soon as the output current resumes normal,the output voltage resumes normal.

THERMAL CONSIDERATIONS

Thermal protection limits power dissipation in NS9010.When the operation junction temperature exceeds 150℃,the OTP circuit starts the thermal shutdown function andturns the pass element off. The pass element turns on again after the junction temperature cools by 30℃.

SHORT CIRCUIT PROTECTION

The short circuit protection starts to work when the output voltage less 0.7V(typ) ,providing maximum safety to end users.

EFFICIENCY

The efficiency of NS9010 can be determined from equation:

$$Efficiency = \frac{Vout1 \times Iout1 + Vout2 \times Iout2}{Vin \times (Iout1 + Iout2 + I_Q)}$$

As the equation,Vout is the output voltage of the LDO,Vin is voltage of the power supply,I_Q is the quiescent current of the LDO.From the equation,the efficiency of the device meliorates as the Vout approaches the Vin.The dropout voltage and quiescent current of NS9010 both are very low,so it's efficiency is better than other LDOs.

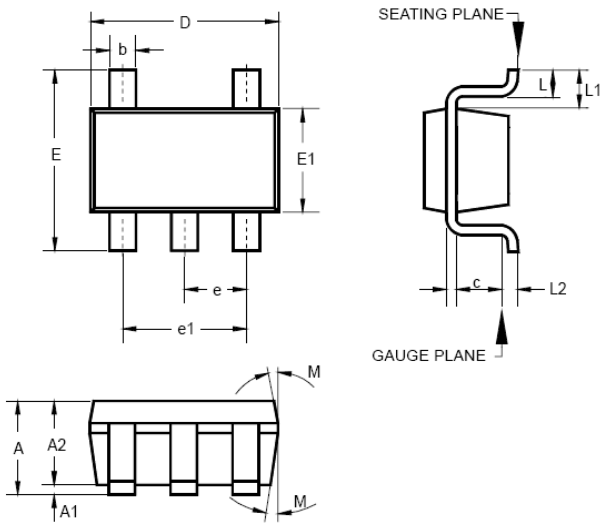
PROPER SELECTION OF PACKAGES

Because different package's type have different thermal resistance (θ_{JA}),users should select appropriate package's type basing on device's practical power dissipation. The maximum power dissipation can be calculated by following formula:

$$Pd = (Vin - Vout1) \times Iout1 + (Vin - Vout2) \times Iout2$$

The junction to ambient thermal resistance (θ_{JA}) for SOT23-5L is 240℃/W.For recommended operating conditions specification of NS9010, the maximum junction temperature of the die is 125℃.SOT23-5L supports the maximum power dissipation(T_A=25℃)is: (125-25)/240=417mW.

Physical Dimensions



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	-	-	0.057	-	-	1.45
A1	-	-	0.006	-	-	0.15
A2	0.035	0.045	0.051	0.90	1.15	1.30
b	0.012	-	0.020	0.30	-	0.50
c	0.003	-	0.009	0.08	-	0.22
D	0.114 BSC			2.90 BSC		
E	0.110 BSC			2.80 BSC		
E1	0.063`BSC			1.60 BSC		
e	0.037 BSC			0.95 BSC		
e1	0.075BSC			1.90 BSC		
L	0.012	0.018	0.024	0.30	0.45	0.60
L1	0.024 REF			0.60 REF		
L2	0.010 BSC			0.25 BSC		
°M	5°	10°	15°	5°	10°	15°

Figure5.The Package of SOT23-5L

Notice：Shenzhen Nsiway Co. LTD. Reserve the right to modify the datasheet at anytime,and without notice, Only Shenzhen Nsiway Co. LTD. have the right to explain the content in this datasheet.